HY-G-300®

7757
Bendix® Type TE-81

RELIABLE HARD GLASS MINIATURE BEAM POWER AMPLIFIER FOR PULSE AND HIGH VOLTAGE REGULATOR SERVICE

DESCRIPTION

This high perveance beam power amplifier tube is one of the Bendix line of HY-G-300 tubes. It has been designed for high voltage pulse modulator and deflection amplifier use in aircraft, military, and industrial applications where reliable operations at high voltages during vibration and shock, and freedom from internal arcing are important. Its ability to operate at 3000 volts without arcing and to deliver 2 ampere peaks of cathode current make it ideal for use in such applications as pulse modulators, blocking oscillators, high voltage regulators, switching, deflection amplifiers, etc. The reliable design and processing techniques provide the above characteristics in a package that will operate reliably in military environments.

Each tube is subjected to a high voltage, high energy, lint and particle elimination process, and a minimum of 24 hours of pulse operation run-in at high peak cathode currents. This run-in serves to eliminate early failure under operating conditions and to stabilize tubes under pulse operating conditions.

Since this tube is designed for use in equipment with high voltage and where high levels of vibration and shock are encountered, special materials, and processing techniques are employed. Inasmuch as destructive internal arcing usually culminates in ionization, it is important that tubes used at high voltages be extremely well evacuated at high temperatures to remove residual gases which may ionize. The transmitting tube type materials and processing utilized in the Bendix HY-G300® line result in tubes that are inherently gas free and capable of high dissipation.

The addition of a titanium anode structure performs a dual function: (1) The gettering capability of titanium permits the elimination of gettering by conventional barium flash which may induce arcing by coating various insulating surfaces; (2) Titanium has the advantage of absorbing contaminants on its surface which may otherwise dissociate during operation to cause emission slump.

Other special features include a rugged, pure tungsten, helical heater which is used with a high purity aluminum oxide insulator, enabling reliable operation at high heater-cathode voltages.

The design of this tube is a result of extensive engineering evaluation on special impact vibration equipment in which the accelerations equal or exceed those encountered in severe aircraft applications. The shake table used for these studies shock excites the tubes at a repetition rate of 15 cycles per second with a minimum peak acceleration of 50G. These tests indicate that the Bendix 7757 will survive thousands of hours longer, under extremely adverse conditions.

CHART 1. ELECTRICAL RATINGS*

Heater Voltage (AC or DC)	6.3 volts
Heater Current	0.6 amps
Plate Voltage (Max DC)	3000 volts
Screen Voltage (Max DC)	700 volts
Plate Dissipation (Absolute Max)	14 watts
Screen Dissipation (Absolute Max)	3 watts
Cathode Current (Max DC Value)	75 mA
Cathode Current (Max Inst. Peak value—of continuous sine wave)	150 mA
Cathode Current (Max Inst. Peak Value) Pulse***	2 amps
Heater-Cathode Voltage (Max)	±450 volts
Grid Resistance (Max)	0.1 megohm
Grid Voltage (Max DC)	+5.0 volts
(Min DC)	−200 volts
(Max Inst. Peak Value) Pulse***	+220 volts
Cathode Warm-up Time	45 seconds

*To obtain greatest life expectancy from tube, avoid designs where the tube is subjected to all maximum ratings simultaneously. See application notes.
**Voltage should not fluctuate more than ±5%.
***See pulse rating chart.

CHART 2. MECHANICAL DATA

Base	9-Pin Miniature Nonex Glass—Gold Plated Pins
Bulb	Nonex Glass—T6 ½
Max. Overall Length	3"
Max. Seated Height	2 ¾"
Max. Diameter	⅞"
Mounting Position	any
Max. Altitude***	70,000 feet
Max. Bulb Temperature	300°C
Max. Impact Shock	500 G
Max. Vibrational Acceleration (100 hour shock excited fatigue test, sample basis)	50 G
Life Expectancy	10,000 hrs.

THE Bendix CORPORATION
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ELECTRICAL CHARACTERISTICS AND ENVIRONMENTAL TESTS

CHARACTERISTICS TESTS

CHART 3.

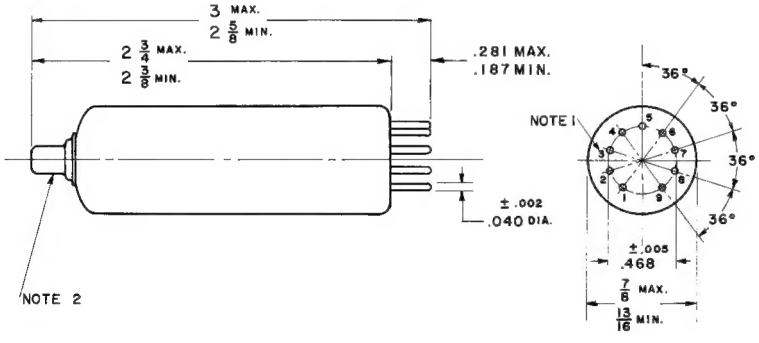
CHARACTERISTIC	SYMBOL	MIN	DESIGN CENTER	MAX	UNITS
PRODUCTION TESTS					
Short and Continuity					
Heater Current	If	0.560	0.600	0.640	A
Heater Cathode Leakage (Ehk = ± 450 Vdc)	Ihk	—	—	50	μAdc
Grid Current	Ic1	—	—	—5.0	μAdc
Plate Current	Ib	33	45	57	mAdc
Screen Grid Current	Ic2	0.5	3.5	7.5	mAdc
Transconductance (1)	Sm	3000	4100	5200	μmhos
Cut off Plate Current (Ec1 = —100, Eb = 3000, Ec_2 = 325)	Ib	—	—	100	μAdc
Pulsed Operation	ib	0.7	—	—	a

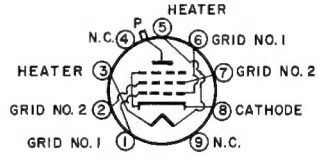
ELECTRODE	Ef	Eb	Ec2	Ec1	egk
TEST CONDITIONS	6.3 volts	250 Vdc	250 Vdc	—12.5 Vdc	—
PULSE TEST CONDITIONS	6.3 volts	750 Vdc	325 Vdc	—200 Vdc	+100 v

ENVIRONMENTAL TESTS

CHART 4.

TEST	CONDITIONS	DURATION
Heater Cycling Life Test	On 1 Min Off 4 Min Ef = 7.0 Ehk = 300	2,000 On-Off Cycles
Survival Rate Life Test	Under "Test Conditions" at 14 W Plate Dis.	100 Hours
Pulse Life Test	ib = 1.0 a	500 Hours
Life "Expectancy" Test	Under "Test Conditions"	10,000 Hours
High Level Fatigue Test	50G—Shock Excitation 15 Cycles/Sec.	100 Hours
Shock	500 G	20 Impacts
Altitude Test	70,000 Feet	5 Minutes
Glass Strain Test	Boiling Water to Ice Water	3 Minutes in Each
Swept Freq. Fatigue	5G—F = 50—500 CPS	96 Hours





BASE DIAGRAM

NOTES

1. NUMERALS DO NOT APPEAR ON BASE, SHOWN FOR REFERENCE ONLY.
2. CAP IS JEDEC C1-2
3. ALL DIMENSIONS ARE IN INCHES UNLESS SHOWN OTHERWISE.

OUTLINE

CHART 5.

AVERAGE PLATE CHARACTERISTICS

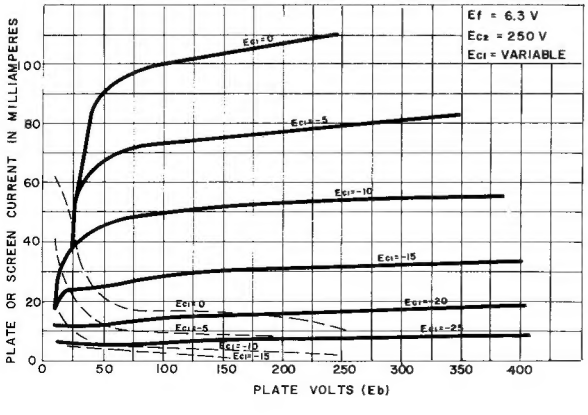
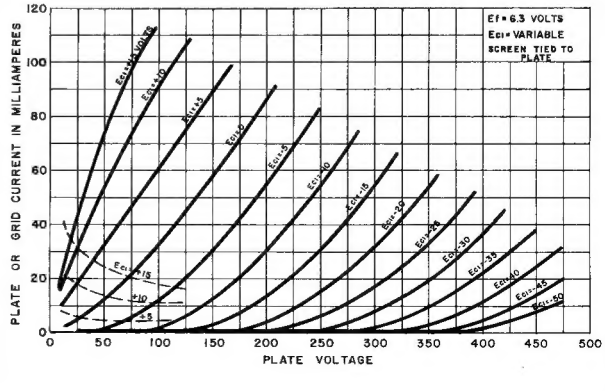


CHART 6.

TYPICAL TRIODE CHARACTERISTICS



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ADDITIONAL PENTODE CHARACTERISTICS

PULSE CHARACTERISTICS

See CHART 13 page 4 (Pulse Ratings)

CHART 7.

TYPICAL PLATE CHARACTERISTICS

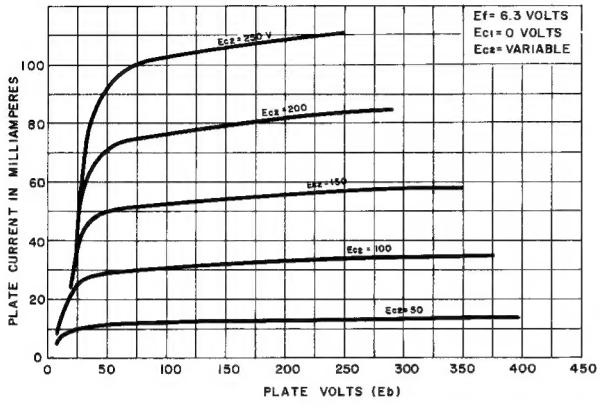

CHART 8.

TYPICAL TRANSFER CHARACTERISTICS

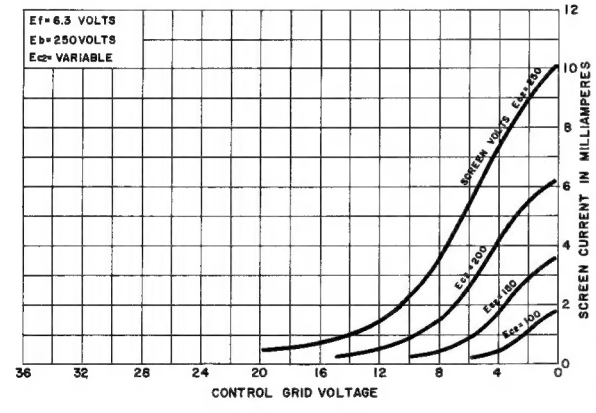

CHART 9.

AVERAGE TRANSFER CHARACTERISTICS

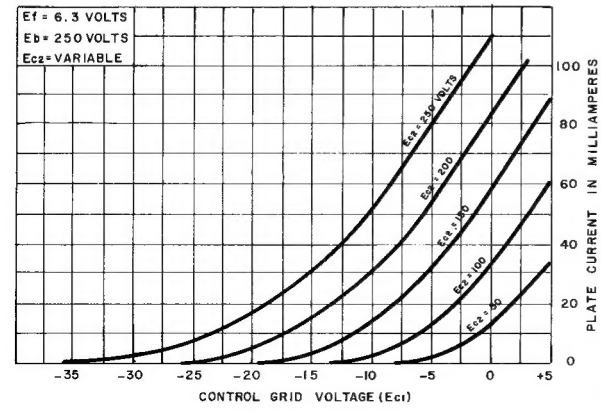

CHART 10.

TYPICAL PULSE CHARACTERISTICS

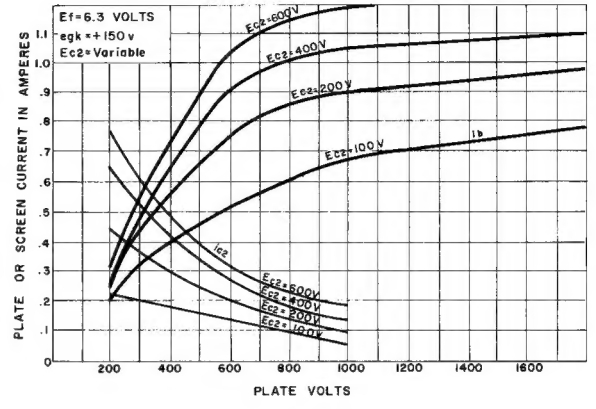

CHART 11.

TYPICAL PULSE CHARACTERISTICS

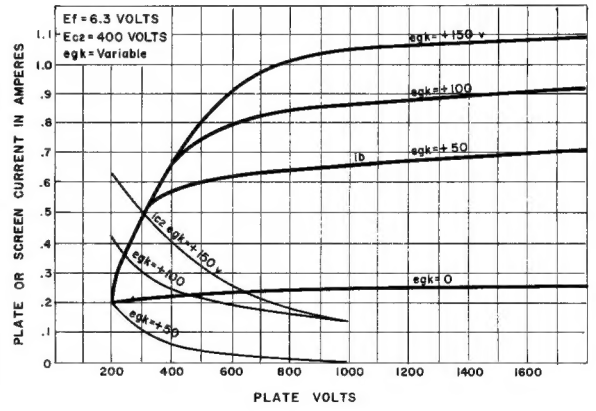

CHART 12.

TYPICAL PULSE CHARACTERISTICS

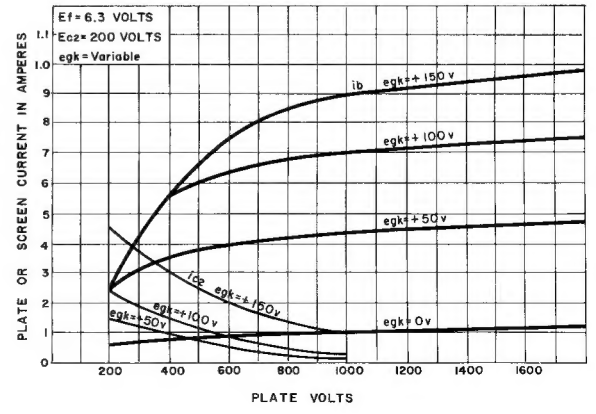

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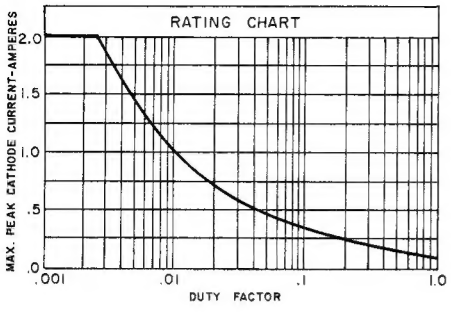
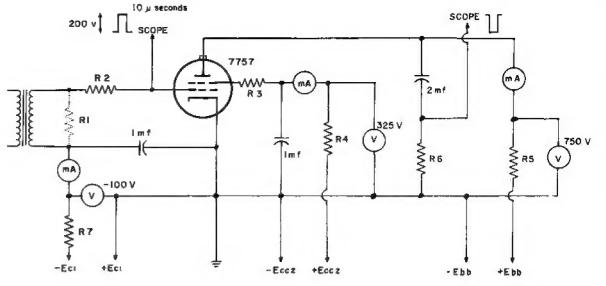
CHART 13. PULSE RATING



DUTY FACTOR (10,000 MICROSECOND AVERAGING TIME) FOR THE 7757 IS DEFINED AS THE RATIO OF "ON" TIME IN MICROSECONDS TO 10,000 MICROSECONDS.

"ON" TIME IS DEFINED AS THE SUM OF THE DURATION OF ALL INDIVIDUAL PULSES WHICH OCCUR DURING ANY 10,000 MICROSECOND INTERVAL.

CHART 14. PULSE TEST CIRCUIT



R1 = ADJUST FOR MINIMUM RINGING AND OVERSHOOT
R2 = 12Ω (APPROX.), 1 WATT (PARASITIC SUPPRESSOR).
R3 = 12Ω (APPROX.), 1 WATT (PARASITIC SUPPRESSOR).
R4 = 5000Ω 100 WATT WIRE WOUND
R5 = 2500Ω 100 WATT WIRE WOUND
R6 = 1Ω 1/2% 10 WATT, CARBON
R7 = 1500Ω 10 WATTS

SCOPE = TEKTRONIX TYPE 535 OR EQUIVALENT.

APPLICATION NOTES

Special attention should be given to the temperatures at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy will be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are directly related to the degree that regulation of the heater voltage is maintained at its center rated value.

This tube is constructed using nonex glass and thus can withstand higher ambient temperatures in operation. However, the bulb temperature should never exceed 300°C at its hottest point and cooling should be employed if necessitated by the additive effects of operation at high altitudes and high dissipation simultaneously or by other sources of heat in the equipment.

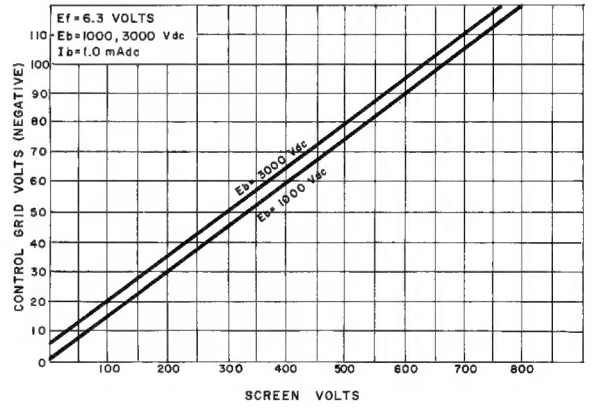
The plate voltage rating and high-perveance of the 7757 make it readily adaptable to varied pulse applications. In order to insure maximum reliability in pulse service the peak plate current should not exceed the value shown in Chart 13 for the required duty factor.

CUT-OFF CHARACTERISTICS

For Ib = 1mA

CHART 15.

TYPICAL CURRENT CUT-OFF CHARACTERISTICS



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